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SUMMARY REPORT OF LOCATIONAL DATA ELEMENTS FOR THE LATITUDE/LONGITUDE DATA STANDARD

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1.0 INTRODUCTION

The Environmental Protection Agency (EPA), Office of Information Resources Management (OIRM), Enterprise Information Management Division (EIMD), through the mission of its Information and Data Management (IDM) Program, has introduced the concept of centralized management and coordination of EPA's distributed information and data resources. The data policies and standards of the IDM program will be supported by data architecture, data models, standard data element domains, and a repository of standard data elements. These work products will facilitate data sharing efforts and effective management of EPA's Information Resources Management (IRM) resources. The focus of this report is the data elements and domains for proposed standard data elements for latitude and longitude coordinates and associated information about method, accuracy, and description for the coordinates.

1.1 Background

The One Stop Reporting Program was initiated by the EPA Executive Steering Committee (ESC) for the purposes of improving the Agency's management of environmental information and reducing the burden of reporting across the regulated community. To achieve the purpose of improving information management the One Stop team has involved the stakeholders, particularly the states, in identifying the need for data standards and participating in their development. To further the goals of the One Stop Program, the Information and Data Management Service Center (IDMSC), Delivery Order (DO) 57, has been tasked to identify needed data standards that will facilitate data sharing and to develop these data standards.

In addition to the need to share information between EPA and the One Stop States, the Reinventing Environmental Information (REI) Program recently undertaken by the Agency has identified the implementation of data standards and the development of electronic reporting processes as major goals. One of the six priority standards identified in the REI Action Plan is a data standard for recording spatial coordinates (i.e., latitude and longitude) and associated information about the coordinates.

On April 8, 1991, the EPA Deputy Administrator signed the Agency's Locational Data Policy, creating IRM Policy Manual 2100, Chapter 13. This policy required the standard collection of geographic coordinates and associated method, accuracy, and description (MAD) codes for all environmental measurements made by EPA employees, contractors, and grantees.

EPA's Locational Data Policy was revised over time in versions of the *Method Accuracy Description Information Coding Standards*. The most recent version, v 6.1, was published on November 7, 1994. MAD v 6.1 presented nine required fields and nine additional recommended (optional) fields to be used when capturing spatial data.

The EPA REI Action Plan identified the latitude/longitude data standard as one of the six high priority standards to be published this year. The standard is scheduled to be adopted by EPA under the REI Program. The draft data standard will be reviewed by the EPA Geographic Information System (GIS) work group for use in updating the *Method Accuracy Description (MAD) Information Coding Standards* from v 6.1 to v 6.2. The Environmental Data Registry (EDR) will be the vehicle for review and approval of the latitude/longitude group of data elements, and will be the ultimate repository of the Agency approved data standards. These standard elements will be used by the Envirofacts Locational Reference Tables (LRT) and the Strategically Preferred Locational Attribute Tables (SPLAT), as well as other Agency information systems containing spatial coordinate data.

1.2 Purpose

The purpose of the data standards is to ensure that the accuracy of the data collected on spatial coordinates can be determined, and to promote the collection of these data in a standard fashion so that it can be employed consistently in GIS and statistical mapping programs. Standards also promote the reuse of information, which can save the considerable expense of collecting multiple sets of accurate, verified spatial data.

The purpose of this report is to propose standard data elements for latitude and longitude coordinates and associated locational information, and to specify domains for those data elements.

1.3 Scope

This document is limited to proposing data elements that identify geographic coordinates and the method, accuracy, and description of the coordinates. The data element attributes and domains contained in MAD v 6.1 were used as a basis for this report.

1.4 References

The following publications were used as references for preparing this report:

Method Accuracy Description (MAD) (Version 6.1) Information Coding Standards for the U.S. Environmental Protection Agency's Locational Data Policy, LDP Sub-Work Group of the Regional GIS Work Group, November 7, 1994.

Draft Proposed Locational Data Element Definitions and Data Values for the EPA Latitude/Longitude Data Standard, U.S. Environmental Protection Agency, Office of Information Resources Management, March 4, 1998.

Locational Data, U.S. Environmental Protection Agency, IRM Policy Manual 2100,

Chapter 13, April 8, 1991.

The following World Wide Web (WWW) site was used as a reference for this report:

Federal Geographic Data Committee (FGDC) Home Page, at http://fgdc.er.usgs.gov/

2.0 METHOD

On February 18, 1998, a meeting was held at the EPA Systems Development Center (SDC) to identify and define the locational data elements to be included in a Latitude/Longitude Data Standard. The group reviewed the locational data elements in the MAD v 6.1, and compared them to the locational data elements in the EDR. Using the MAD v 6.1 as guidance, the data element definitions from the EDR were reviewed and either accepted or revised to reflect changes in Agency policy on standard data representation, and to improve the consistency of the definitions.

The updated list of latitude and longitude data element definitions was sent out to be reviewed by EPA representatives of the GIS work group. Comments were received and incorporated into the data elements and domain values presented in this report.

The changes to the latitude and longitude data elements have been published in the EDR, which will become the vehicle for conducting further review prior to their publication as interim standards.

3.0 RELATIONSHIP TO OTHER SPATIAL DATA STANDARDS

This section describes the relationship between the proposed EPA latitude and longitude data standards and the existing MAD v 6.1 standards to explain the changes proposed. Section 3.2 describes the approved FGDC standard.

3.1 Method Accuracy Description V 6.1

The proposed set of standard data elements is based upon the MAD code data elements. Following is a list of changes recommended to the MAD v 6.1 set of data elements for the proposed standards. Once approved, these standards might become the basis for MAD v 6.2.

- Data Point Sequence Number and Description Sequence were recommended for deletion from MAD v 6.1. These can be handled specifically by application software and do not need to be standardized.

- Reference Point Code and Text, used to identify the location of the point where coordinates were recorded, might include a domain of permissible values that includes the content of the Facility Feature data element (EDR Data Element 6133:1). Appendix B contains the values that might be added to the Reference Point Code and Text domains.

- Vertical Measure was modified to be an optional, rather than mandatory, value.

- It was decided that Source Map Scale should be a number representing the actual map scale, and that ranges should not be recorded. Certain predetermined values could be presented for data entry by an application, but users of the standard must be allowed to enter any numeric values, not just certain codes representing values or ranges.

- Coordinate Data Source has three associated data elements: Name, Code, and Comments. The current comments table is named Location Comments Text, signifying that comments will be about the location. Coordinate Data Source Name includes the values for EPA Regions and States and Tribal entities that are taken from the related standard EDR data elements. The coded values are not the same as for the related source files, due to the need to combine several lists of values and renumber them.

- The EDR contains data elements for Albers X and Y Coordinates. It was decided that there is no need to include these in the latitude/longitude standard, as they are not used frequently.

- The standard will not include “unit of measure” data elements. The standard unit of measure will be in meters for distance and accuracy measures.

- All codes in the value domains are unintelligent. They have multiple digits to allow for additions.

3.2 Federal Geographic Data Committee Standards

Executive Order 12906, signed in April 1994, called for establishment of the National Spatial Data Infrastructure to promote the sharing of geospatial data throughout all levels of government, the private and non profit sectors, and the academic community. Section 3, paragraph (b) states: "Standardized Documentation of Data, ... each agency shall document all new geospatial data it collects or produces, either directly or indirectly, using the standard under development by the FGDC, and make that standardized documentation electronically accessible to the Clearinghouse network."

On June 8, 1994, the FGDC approved the *Content Standard for Digital Geospatial Metadata*

that set standards for the metadata collected on latitude and longitude coordinates. The standard was developed from the perspective of defining the information required by a prospective user to determine the availability of a set of geospatial data, to determine the fitness of the set of geospatial data for an intended use, to determine the means of accessing the set of geospatial data, and to successfully transfer the set of geospatial data. As such, the standard establishes the names of data elements and compound elements to be used for these purposes, the definitions of these data elements and compound elements, and information about the values that are to be provided for the data elements. The standard does not specify the means by which this information is organized in a computer system or in a data transfer, nor the means by which this information is transmitted, communicated, or presented to the user.

This federal standard provides extensive specifications for spatial metadata, but many of the attributes are considered optional. Only the basic identification information about the data set is required. The standard specifies representation for dates and time, as well as latitude and longitude, and network (url) addresses. Additional required metadata components include: Citation, Description, Time Period of Content, Status, Keywords, Access Constraints, and Use Constraints.

4.0 PROPOSED LOCATIONAL DATA ELEMENT DEFINITIONS AND ATTRIBUTES

Exhibit 1 presents the proposed contents of the group of standard latitude and longitude data elements. The table shows the MAD code data element names, the proposed standard data element names, EDR identification numbers (including the data element identification number and version), definitions, lengths, and a code set indicator that identifies whether or not the data element is enumerated (i.e., is associated with a fixed list of permissible values). The data elements are grouped by their optionality. Those data elements that are required for inclusion in any system collecting spatial data are shown as “Mandatory.” The rest are shown as “Optional.” The EDR will be used as the repository for the data elements and definitions during the review and approval process, as well as upon adoption of the final standard. Appendix A contains EDR data element reports that show more detailed data element attribute information (including value domains) for each locational data element. Appendix B contains proposed additional text and code values for reference points.

MAD Codes	EDR Data Elements	Proposed Definitions	Length	Code Set
Mandatory				
Latitude	Latitude Measure (DE 5518:1)	The measure of the angular distance on a meridian north or south of the equator.	10	No
Longitude	Longitude Measure (DE 5520:1)	The measure of the angular distance on a meridian east or west of the prime meridian.	11	No
Method of collection	Horizontal Collection Method Text (DE 5731:1)	The text that describes the method used to determine the latitude and longitude coordinates for a point on the earth.	40	Yes
	Horizontal Collection Method Code (DE 5238:1)	The code that represents the method used to determine the latitude and longitude coordinates for a point on the earth.	3	Yes
Accuracy Value and Unit	Horizontal Accuracy Measure (DE 5264:1)	The measure of the accuracy (in meters) of the latitude and longitude coordinates.	6	No
Description Category	Reference Point Text (DE 5288:1)	The text that identifies the place for which geographic coordinates were established.	50	Yes
	Reference Point Code (DE 5608:1)	The code that represents the place for which geographic coordinates were established.	3	Yes

Exhibit 1. Proposed Locational Data Element Definitions and Attributes

MAD Codes	EDR Data Elements	Proposed Definitions	Length	Code Set
Horizontal Datum	Horizontal Reference Datum Name (DE 5292:1)	The name that describes the reference datum used in determining latitude and longitude coordinates.	7	Yes
	Horizontal Reference Datum Code (DE 5308:1)	The code that represents the reference datum used in determining latitude and longitude coordinates.	3	Yes
Source Scale	Source Map Scale Number (DE 5318:1)	The number that represents the proportional distance on the ground for one unit of measure on the map or photo.	19	No
Point-Line-Area	Geometric Type Name (DE 5761:1)	The name that identifies the geometric entity represented by one point or a sequence of latitude and longitude points.	6	Yes
	Geometric Type Code (DE 5614:1)	The code that represents the geometric entity represented by one point or a sequence of latitude and longitude points.	3	Yes
Optional				
Date of Collection	Data Collection Date (DE 5296:1)	The calendar date when data were collected.	8	No
Source	Coordinate Data Source Name (DE 5322:1)	The name of the party responsible for providing the latitude and longitude coordinates.	35	Yes
	Coordinate Data Source Code (DE 5310:1)	The code that represents the party responsible for providing the latitude and longitude coordinates.	3	Yes

Exhibit 1. Proposed Locational Data Element Definitions and Attributes (Continued)

MAD Codes	EDR Data Elements	Proposed Definitions	Length	Code Set
Description Comments	Location Comments Text (DE 5616:1)	The text that provides additional information about the geographic coordinates.	150	No
Vertical Measure	Vertical Measure (DE 5612:1)	The measure of elevation (i.e. the altitude), in meters, above or below a reference datum.	10	No
Vertical Measure Method of Collection	Vertical Collection Method Text (DE 5326:1)	The text that describes the method used to collect the vertical measure (i.e., the altitude) of a reference point.	41	Yes
	Vertical Collection Method Code (DE 5314:1)	The code that represents the method used to collect the vertical measure (i.e., the altitude) of a reference point.	2	Yes
Vertical Measure Accuracy	Vertical Accuracy Measure (DE 5312:1)	The measure of the accuracy (in meters) of the vertical measure (i.e., the altitude) of a reference point.	8	No
Vertical Datum	Vertical Reference Datum Name (DE 5324:1)	The name of the reference datum used to determine the vertical measure (i.e., the altitude).	17	Yes
	Vertical Reference Datum Code (DE 5306:1)	The code that represents the reference datum used to determine the vertical measure (i.e., the altitude).	2	Yes
Verification	Verification Method Text (DE 5737:1)	The text that describes the process used to verify the latitude and longitude coordinates.	40	Yes
	Verification Method Code (DE 5268:1)	The code that represents the process used to verify the latitude and longitude coordinates.	2	Yes

Exhibit 1. Proposed Locational Data Element Definitions and Attributes (Continued)

APPENDIX A

Data Values for EDR Locational Data Elements

APPENDIX B

Proposed Additional Text and Code Values